Outline of the proposal research topic

“Biology of some cestode parasites of freshwater fishes from Niwali Dam tq. Jintur, District Parbhani, M.S.”

Submitted

To

Swami Ramanand Teerth Marathwada University, Vishnupuri, Nanded.

By

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INTRODUCTION

Parasitology is the branch of biology which deals with the study of Parasites. Parasites are having in the body of organism. Parasites are of two types like Ectoparasites & Endoparasites. Endoparasites are present inside the body of an organism. It occurs from Pisces to Mammals (P. S. Bele., 2015).

Cestoda is a class of parasitic flatworms of the phylum Platyhelminthes. The best-known species are commonly called tapeworms. Cestodes have perfectly adapted to parasitic mode of life amongst all the helminthes and inhabit the intestinal tract of almost all the vertebrates including humans in their adult stages. Cestodes are specialized endoparasites that are characterized by their dorsoventrally flat and segmented body. Cestodes or tapeworm are the parasites present inside the intestine and remain attached to host. The ribbon-shaped body of tapeworms is the largest and among the oldest of the intestinal parasites that have plagued humans and other animals since time immemorial. They are cosmopolitan in distribution and exist in many forms. There are 14 orders of Eucestoda. Most of the cestode orders (except Cyclophyllidea) have members that can infect fish (both Chondrichthyes and Osteichthyes) as adults. Eight cestode orders Amphilinidea, Spathebothriidea, Caryophyllidea, Trypanorhyncha, Pseudophyllide, Proteocephalidea, Haplobothriidea and Nippotaeniide are characterized by freshwater fish.

Many cestodes are known to be the agents of serious fish diseases and also represent important public health problem (**K Chandra et al., 2017**).

Parasitism is a natural way of life, among the large number of organism and parasitic diseases are the major public health problem, which results into morbidity and mortality in tropical countries, including India. Particularly in the socio-economically under developed societies in the world (S. S. Nanware et. al, 2012).

Fishes are aquatic, marine, freshwater, herbivores or carnivores, cold-blooded, oviparous or ovoviviparous vertebrate animal. Body usually spindles shaped, streamlined and differentiated into head, trunk and tail. Fish are important components of ecosystem from ecological, medicinal, nutritional and economical point of view.

Fish constitute a major component of diet for human being. They are extensively used as a protein-rich food for human consumption. As a medicinal point of view, fish provides vitamins like A, D, E, K and B12 , fish manure, fish glue, dried fins and fish leather etc .besides being rich in calcium, iron, phosphorous and iodine for human diet (K.D. Kaldate).

The fish is parasitized by helminthes parasites, which reduce its food value, as they provide highly nutritious food. Many cestodes are parasites of fish. Some of these can be deleterious to the health of their hosts and have been incriminated as agents of diseases in farmed fish.

Schmidt (1986) listed 3,806 known cestodes belonging to 13 orders, 66 families, and 601 genera. Of these, approximately half are parasites of fish; they include groups such as the Caryophyllidea, Lecanicephalidea, Trypanorhyncha, Tetraphyllidea, Diphyllidea, Proteocephalidea, Pseudophyllidea, Spathebothriidea and Nippotaeniidea (Linton, 1889; Yoshida, 1917; Yamaguti, 1934, 1952, 1959, 1960; Wardle & McLeod, 1952; Shinde et al., 1981, 1991; Schmidt, 1986; Khalil et al., 1994)(**Yang Wenchuan. 2007**).

These fish are parasitized by helminthes parasites, which reduce food value. They infect man and also invade domestic animals and wildlife. Keeping in view, importance of these cestode infections of freshwater fish, the present study was designed to evaluate the prevalence of cestode parasitizing freshwater fish (D. B. Bhure et al, 2011).

Cestodes are harmful to vertebrate class Pisces to class Mammals. Therefore study of cestode in the taxonomical, histopathological and biochemical point of view is important.

Review of Literature and Development in the subject

Cestodes are the most common and abundant parasites of freshwater fish. They are occurring as endoparasites usually in the gut. Morphological studies on cestode parasites of fish were initiated in the early 19th century itself by scientists, but they received momentum in the 20th century. To date around 10,000 species of cestode parasites were recorded from freshwater fish. The present investigation deals with morphology of cestode parasites includes the genera like *Gangesia* Woodland, 1924, *Senga Dollfus*, 1934 and *Circumoncobothrium Shinde*, 1968. The genus Gangesia was erected by Woodland in 1924 with its type species *G. macrons* collected from the *Macrones seenghala* from India. Southwell (1930) however recognized only four valid species of the genus, others being regarded as synonyms and *G. parasiuri* was reported by Yamaguti in 1934. Later on Wardle McLeod, (1952) accepted Verma's *G. pseudotropii* which is proposed as new genus *Vermala* by Nybelin, (1942) but later Dhar et al., (1980) added on more species and given a revised diagnosis of the genus *Gangesia* and proposed to divide genus *Gangesia* Woodland (1924) into two sub- genera as *Gangesia* (*gangesia*) and *Gangesia* (*v*ermaia). Later on many species are added in this genus. In 1948 Singh described *G. lucknowia.* Roitmann et. al. in 1964 added *G. polyonchis*. Later Dhar and Fotedar added new species in 1980 *G. kashmirensis*.

G. sonhensis species added by Malhotra et.al. in 1980. *G. mehmadabadensis* in 1981 added by Malhotra et.al. Later on Gupta and Arora added *G. haryanaei* in 1982. *G. indica* in 1982 added by Gupta and Parmar. Later Seth and Capoor in 1982 described *G. hanumanthai*. *G. paithanesis* described in 1983 by Jadhav et.al. In 1984 *G. fotedari* put forward by Dhar and Majdah. Deshmukh et. al. in 1989 added *G. shindei*. Later on in 1990 Shinde and Wankhede described *G. aurangabadensis*. After 9 years in 1999 Hiware added *G. senghali*. Later in 2001 Jadhav et.al. added *G. clariusae*. In 2004 Wankhede Hemlata described *G. mastacembli*. Again in 2004 Pawar et.al. added *G. rohitae*. Hiware et.al. 7 added *G. ambikaei* in 2004. *G. batrachusi* added later on by Begum in 2007. In 2010 *G. wallaguae* added by Pradhan et.al. In 2011 *G. bendurensis* described by Reddy et.al. *G. jayakwadensis* in 2012 added by Shukla et.al. Later *G. shivajiraoi* added by J. Dhole in 2012. The genus Senga was erected by Dollfus in 1934 with its type species *S.besnardi*. Later on many species are added in this genus. In 1933 Teseng described *S. ophiocephalina*; Woodland, 1934 added *S. pcynomera*. Johri, 1956 described *S.lucknowensis*. In 1964, Furnando and Furtado added *S.malayana* and *S.parva*. Later on Furtado et. al, 1971 added *S.pahangesis*. In 1973 Ramadevi et. al., described *S.visakhapatnamensis*. In 1980 three species are added i.e. *S.khami* by Deshmukh et. al.; *S.godavarii* by Shinde et. al. and S.*aurangabadensis* by Jadhav et. al. Kadam et. al., 1981 added *S.paithanensis*. Majid et. al., 1984 described *S.raoi* and *S.jagannathae*.

In 1991 Jadhav et. al., added *S.gachuae* and *S.maharashtrii*; Monzer Hasnain, 1992 added *S.chauhani*. Tat et. al., 1997 added *S.mohekarae*. In 1993 Hiware described *S.armatusae*. Patil et. al. 2003 added *S.tappi*. 2006 Pande et. al. described *S.ayodhensis* and *S.baughi*. Lastly in 2008, described *Senga madhavii* and *Senga sataraensis* by Bhure D.B.

Shinde, 1968 erected the genus *Circumoncobothrium* with its type species *C.ophiocephali*. In 1976 Jadhav et. al., described *C.aurangabadensis*, *C.raoii* and *C.gachuai*. Chincholikar et.al. 1976 added *C.shinde* and *C.bagariusi*. Shinde added *C. khami* in 1977, *C.alii* in 1994; *C.armatusae* in 1999; *C.mastacembelusae* in 2002. Jadhav et. al., 1990 described *C.yamagutii*. In 1998 added *C.vadgoanensis* by Patil et. al. and *C. baimii* by Wongsawad et. al. Kalse et. al., 1999 added *C. punctatusi*. Later on 2002 Pawar et. al. described *C.armatusae* minor. Tat et. al., 2004 described *C.manjari*. Further in 2005 added *C. vitellariensis* by Supugade et. al. Later 2008, described *C. mangalbaiae* and *C. govindae* by Bhure D.B. Nanavare S.S. et al, works on study of fish cestodes genus *Silurotaenia* and also works on population dynamics in year of 2011-2012.

Objective of Research:

1) To find out species of Cestode from fish from Niwali dam tq. Jintur
2) To study its Morphology and taxonomy.
3) To find out the histopathological effects of these cestode on the infecting and non-infecting intestinal region of the host.
4) To analyse the biochemical content of cestode parasite from fish.

Methodology to be adopted

1) Taxonomy:

Following steps should be Studied

a) Collection of cestode parasite from Niwali dam locality.
b) Flattening and preservation of cestode parasite in 4% formalin.
c) Staining of cestods in Harri's Haematoxylene
d) Mounting in DPX.
e) Identification under microscope for taxonomical study.
f) Sketch and drawing of observed slides under microscope.

2) Histopathology:

a) Infected and Non infected host intestine should be fixed in fixative Bouin's fluid.
b) Block preparation.
c) Section cutting of prepared blocks.
d) Staining of prepared slides.
e) Identification of slides for histopathology study

3) Biochemistry:

a) Glycogen Estimation (Kemp et. al method, 1954)

b) Protein Estimation (Gornell et. al method, 1949)

c) Lipid Estimation (Methanol-chloroform method)

Importance of study

International status:

In the field of Cestode taxonomy Miller, Goezer, Rudophi, Ehronberg, Leiper, Gegenbaur Vough, Linstow, Moniex etc. who worked in establishing the Cestode taxonomy as a fully fledged branch of Zoology. The study of chemical compositon of the parasite is gaining importance in modern times. Notable contributions with this regard were made on cestode parasites biochemistry by Army (1966), Kemp et.al. (1954). the first point of view (the impact of Cestode infection on the hosts physiology and nutrition) has been the subject of numerous investigations over the past decade (Solomons, 1994; and Scott, 1979, Edirisinghe and Tomkins, 1995, Coop and Holmes 1996). The research on the complex interactions among host nutritional status and parasitic infection has mainly focused on the detrimental consequences of parasitic infections on host nutritional status and on mechanism by which malnutrition immune-competence (Scott and Koshki, 2000).

Nutritional deficiencies as a result of intestinal Cestode infection have been the subject of several investigations (Hadju, et.al. 1996; Lunn and Nothrop Clewes, 1996). Intestinal Cestodes may affect the nutritional status by causing increased nutrient loss, in addition to decreased food intake and nutrient absorption (Edirisinghe and Tomkins, 1995). Detailed investigations of the

mechanisms of gastrointestinal dysfunction of the parasitized host have shown that the increased endogenous loss of protein into the gastrointestinal tract is a key feature, partly as a result of leakage of plasma protein but also from increased exfoliation of gut epithelial cells and mucoprotein secretion (Brown et. al. 1991).

Histopathological investigation such as marked lesions in the mucosa inflammation and congestion of mucous glands and intestinal hemorrhages lead to severe anemic condition in the fish. (Williams, 1967, Roberts 2001). Besides the mechanical injuries, Atorphy of tissues and lesions of the alimentary canal, blood vessels or duct etc. the parasite also induce the toxic metabolic byproduct (Endotoxic / ectotoxic) elicting changes in blood, enzymes, vitamins and hormonal activity of the host (Symons and Fairbain, 1963), Polynter, 1966, Mongkol Primpol, 2000, Ekman and Norrgren, 2003)

National Status

In India also a lot of work was conducted on Cestode taxonomy in various Univeristies particularly at Aligarh, Allahabad, Lucknow, Chennai, Hyderabad, Aurangabad and Jammu Kashmir by eminent Cestodeologist like Thapara, Mehra, Pande, Srivastava, Chauhan, Mirza, Basir, Gupta N.K. , Gupta S.P. , Singh K.S. etc. on Biochemistry, Hiware C.J. (1999), Shendge A.N. (2008) , P. Anilkumar et.al. (2009) , Shabana et. Al.(2010).

The extensive study on the host parasite relationship has been carried out by *Amoebotaenia Indiana* by Mitra and Shinde (1980); *Hymenolepis nana* by Bailey (1951). Baur et.al. (1959). Amlacher (1961), Hyunga E.G. (1977) and Mackiewizc (1972) have studied the histopathology of intestine of fish caused due to cestodes. Gopal Krishnan (1968), Satpute A. and Agarwal (1974), Ahmed et. al (1975), Bose and Sinha (1979) & 1981) , Niyogi A. and Agarwal S.M. (1989) have studied the *Caryophyllacidiasis* in fish host. Hiware et.al. (2008) have studied histopathology of intestine of fresh water fish *Clarias batrachus* caused due to *Lytocestus clariasae*. A distinctive acute tubular epithelial necrosis associated with interstitial haemorrhages of the posterior kidney was originally described as haemorrhagic kidney syndrome in Atlantic Salman (Byrne et.al. 1998, Shashi et.al. 2008). Bhure D.B., Nanavare S.S. et al, works on study of fish cestodes genus *Silurotaenia* and also works on population dynamics in year 2010-11. Hiware C.J. and Pardeshi P.R. also worked on genus *Senga Sp*. in 2011-
12. Jaywant Dhole works on taxonomic evaluation of genus Gangesia in 2012-13. From freshwater fish *Wallago attu*. Sawarkar B.W. works on investigation of *cestodes Siluretenia* (Nybelin, 1942) works on this genus in 2013.

Significance of the study:

Fish plays an important role in keeping the ecosystems in balance and also enhance the beauty of nature. But Cestode parasites attack on fish and cause heavy loss to their host. i.e. in turn they affect the human economy and nation's economy too. The present work deals with Morphology, Taxonomy, Histopathology and Biochemistry of the cestode parasites of which will helpful to focusing in knowldge of cestode.

Proposed plan of work

Year wise plan of work and targets to be achieved

1. First Year:

a) Review of literature and collection fish parasites.

b) Taxonomical Study of parasites.

2. Second Year:

a) Collection, preservation an staining of parasites.

b) Histopathological study of infected tissue of host.

c) Biochemical estimation of fish parasite

1. Third Year:

- Thesis writing, typing and thesis submission.

References:

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Signature	**Signature**
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